

## **REMARKS**

Entry of the foregoing and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

As correctly noted in the Office Action Summary, claims 1-46 were pending and claims 11-46 were withdrawn. By the present response, claims 1 and 2 have been amended, claims 20-46 canceled and claims 47-50 have been added. Thus, upon entry of the present response, claims 1-20 and 47-50 remain pending (claims 11-20 withdrawn from consideration) and await further consideration on the merits.

Support for the foregoing amendments can be found, for example, in at least the following locations in the original disclosure: the original claims, the specification, page 5, lines 6-12 and Figure 2.

### ***CLAIM REJECTIONS UNDER 35 U.S.C. §112***

Claim 2 stands rejected under 35 U.S.C. §112, second paragraph on the grounds set forth in paragraph 3 of the Official Action. By the present response, applicants have amended 2 in a manner which addresses the above-noted rejection. Therefore, reconsideration and withdrawal of the rejection is respectfully requested.

### ***CLAIM REJECTIONS UNDER 35 U.S.C. §102***

The present application is generally directed to microtextured ion exchange system structures. Generally, fuel cells are stacks or multiple layers of alternating separators and electrodes or membrane electrode assemblies (MEA). The separators typically contain elements that deliver the fuel (e.g., hydrogen to the

anode and oxygen to the cathode) of the fuel cell. The fuel is appropriately distributed by the separator into the electrodes of the fuel cell where the reaction occurs. In the present application, applicants disclose microtexturing by laser radiation the reactive surface area of a substrate to which is delivered the fuel of the fuel cell. The increased reactive surface area has two scales of roughness that improves the reaction efficiency and the overall efficiency of the fuel cell.

The exemplary features are generally embodied in applicants' independent claim. For example, claim 1 recites that a substrate for an ion exchange electrode structure comprises, *inter alia*, an exterior surface wherein at least a portion of the exterior surface is irradiated by a laser radiation to enlarge a reactive surface area on the exterior surface. Dependent claims disclose additional features such as layers with a conductive material (claim 4), use of a catalytic material (claims 6 and 8), projecting surface features (claim 47), such as a cone-shape (claim 48), and two-scale roughness (claim 49).

Claims 1-3 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,051,331 to Spear, Jr. et al. (hereafter "*Spear, Jr. et al.*") on the grounds set forth in paragraph 5 of the Official Action.

*Spear, Jr. et al.* discloses a separator for a fuel cell. The separator has numerous intricate microgroove fluid distribution channels formed in its surface, preferably by etching, but also by laser ablation or cutting and so forth. See column 3, lines 37-40. Thus, in contrast to applicants' independent claim, *Spear, Jr. et al.* discloses a laser ablation method to form microgroove fluid distribution channels in a separator of a fuel cell. In other words, *Spear, Jr. et al.* discloses a separator which distributes fuel to reaction areas and not reactive surfaces as presented in claim 1.

In light of at least this noted difference, applicants respectfully assert that an anticipatory rejection is improper because each and every element of applicants' independent claim 1 is not disclosed by the cited reference. Therefore, this rejection should be withdrawn.

Claims 1-10 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,361,892 B1 to Ruhl et al. (hereafter "*Ruhl et al.*") on the grounds set forth in paragraph 6 of the Official Action.

*Ruhl et al.* discloses reactant microchannels in electrodes of a fuel cell. The microchannels transport reactant gas. See Abstract. *Ruhl et al.* further discloses that the variable cross-section microchannel pattern serves to distribute the flowing gas uniformly within the electrode, regulates the pressure drop of this gas, and also creates preferred local gas velocities especially where the gas exits the electrode. Thus, *Ruhl et al.* is not concerned with the reactive surface area nor is he concerned with increasing or in any way altering the surface area of a reactive surface of a fuel cell. Rather, *Ruhl et al.* merely addresses the problem of distribution of fuels within a fuel cell. In light of at least this difference, applicants respectfully assert that an anticipatory rejection is improper because the disclosure in *Ruhl et al.* does not contain each and every element of applicants' independent claim. Therefore, the rejection should be withdrawn.

Claims 1-3, 8 and 9 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,471,993 B1 to Shastri et al. (hereafter "*Shastri et al.*") on the grounds set forth in paragraph 7 of the Official Action.

The disclosure of *Shastri et al.* is directed to polymer matrices formed in a mold by precipitation. See column 11, lines 22, *et seq.* and line 44. The Examiner

has referenced column 16, lines 52-57 for the disclosure of laser ablation. However, the reliance on this portion of the disclosure in *Shastri et al.* is misplaced. Namely, the referenced portion of *Shastri et al.* merely notes that the formed polymer matrix can be further shaped by laser ablation, micromachining, the use of a hot wire, and by CAD/CAM processes and does not disclose increasing a reactive surface layer by laser ablation. In other words, *Shastri et al.* merely uses laser ablation (among other techniques) for forming the outer, overall rough shape of the porous polymer matrix formed in the previously disclosed mold.

Further, as disclosed in column 17 beginning at column 10, it's clear from *Shastri et al.* that the voids or interior surface of the polymer matrix is formed by precipitation. In contrast, applicants' independent claim 1 references an exterior surface roughened by laser ablation.

In light of at least the above-noted differences, applicants respectfully assert that an anticipatory rejection based on the disclosure in *Shastri et al.* is improper, because each and every element of applicants' independent claim is not disclosed therein. Accordingly, withdrawal of this rejection is respectfully requested.

**CONCLUSION**

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: April 22, 2004

By: 

Patrick C. Keane  
Registration No. 32,858

50,891

Hewlett Packard Company  
Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, CO 80527-2400

(703) 836-6620